CORAL TRIANGLE INITIATIVE
ON CORAL REEFS, FISHERIES AND FOOD SECURITY

PAPUA NEW GUINEA

IABAM & PAHILELE COMMUNITY BASED RESOURCE MONITORING PROGRAM SURVEY REPORT #: 4

MONITORING PERIOD: SEPTEMBER 2011

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Iabam & Pahilele Community Based Resource Monitoring Program
Survey Report #: 4
Monitoring Period: September 2011

AUTHOR:
Wellington Wamula
Jameson Solipo

EDITOR:
Noel Wangunu

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For more information on the Coral Triangle Initiative, please contact:

Coral Triangle Initiative on Coral Reefs, Fisheries and Food Security Interim-Regional Secretariat
Ministry of Marine Affairs and Fisheries of the Republic of Indonesia
Mina Bahari Building II, 17th Floor
Jalan Medan Merdeka Timur No. 16
Jakarta Pusat 10110, Indonesia
www.coraltriangleinitiative.org

CTI-CFF National Coordinating Committee

Ms. Kay Kalim
Deputy Secretary
Sustainable Environment Programs Wing
Department of Environment and Conservation
1st Floor, Bemobile Building
National Capital District, Port Moresby, Papua New Guinea

4

IABAM & PAHILELE COMMUNITY BASED RESOURCE MONITORING PROGRAM

SURVEY REPORT #: 4
MONITORING PERIOD: September 2011

MONITORING REPORT BY:

Wellington Wamula and Jameson Solipo
(*Iabam-Pahilele CMMA Data Specialist*)

& Edited by

Noel Wangunu
(Conservation International)

PREFACE

Welcome everyone to this 3 monitoring report for the Jabam & Pahilele CMMA. In this report I firstly would like to sincerely thank my fellow monitoring counterparts who have participated in this monitoring period. This monitoring period was a great challenge compared to the other two monitoring period. Rough seas and strong winds driven by the southeast trade winds further deteriorated sea condition through poor water visibility and cold water temperatures which affected a number of individuals in the monitoring team. Despite these experiences, I again congratulate each member of the team who has participated in this monitoring period.

Secondly, I would like to commend those participants who have joined the team for the first time. You have contributed a lot and I believe your continue participation will only bring about a strong monitoring team and support for any new persons who wish to join the team in the next monitoring period which will be in September this year.

Lastly, I would like to extend my sincere thanks on behalf of the monitoring team and the community of Jabam and Pahilele to Conservation International for their time and commitment in ensuring our community is given this privilege to know and monitor our resources so that we know what is happening in our seas as we continue to use and manage what we have.

Chairman Jabam & Pahilele CMMA
Mr. Terry Abaijah

About this report

This report presents the findings from the community based resource monitoring conducted in September 2011. The findings are presented in the same format as those done for monitoring period December 2010, March 2011 and June 2011, which is easy to read and shall provide you with chance to make comparison with data and results provided in the two last monitoring reports.

1. INTRODUCTION

This report summarizes marine survey results conducted by the Iabam and Pahilele locally trained marine monitoring team. Field surveys were conducted between the 7th and 15th September 2011.

No significant findings were made during the period however, there were little changes noticed in the monitoring transacts inside and outside no-take which are discussed further in section 4. of this report.

Some of the notable results gathered from this survey are further summarized below.

1. Tawali Namonamo (NT.1) recorded the highest average populations for herbivore and carnivore(12 herbivore and 12 carnivore per 500m² sampling area) in the June while in this monitoring, we found that Siasialina(NT.4) recorded the highest counts for both herbivore and carnivore fishes (11.5 herbivore and 12 carnivore fishes per 500m² monitoring transact. Other areas having second and third fish abundance in this monitoring include Banibani Siga (NT.6) and Siasialina (NT.4) where in June Siasialina record the second highest and Banibani Siga recorded the third highest averages in the population of herbivore and carnivore fishes.

2. In this monitoring it was observed that Dana Gedu had high distribution of sea cucumber than any other monitoring stations inside and outside no-take. Many of these sea cucumber recorded were from the genus *Holothuria*.

3. Results for other invertebrates including giant clam, rock lobster and trochus remained low in all monitoring sites inside no-take and outside no-take

4. All monitoring sites showed no variation in the amount of live coral cover however; the lower reef areas of Siasialina had a lot of unconsolidated coral rubbles which showed fresh evidence of recent damages to branching corals.

5. Sea cucumber from genus *Holothuria* continue to be the most abundant family with high counts of Lollyfish (*Holothuria atra*) with averages of 2.50 per 500m² for no-take and 0.33 per 500 m² for areas outside no-take.

6. Population of crown-of-thorn continues to show slight increase in this monitoring compared to the previous monitoring program.

7. Sea cucumber genera *Bohadschia* had second major distribution and abundance within the monitoring transacts with the percentage of 0.83 per 500 m². There was no record for Bohadschia in any reefs observed outside no-take areas.

2. METHODS

2.1. Field Data Collection

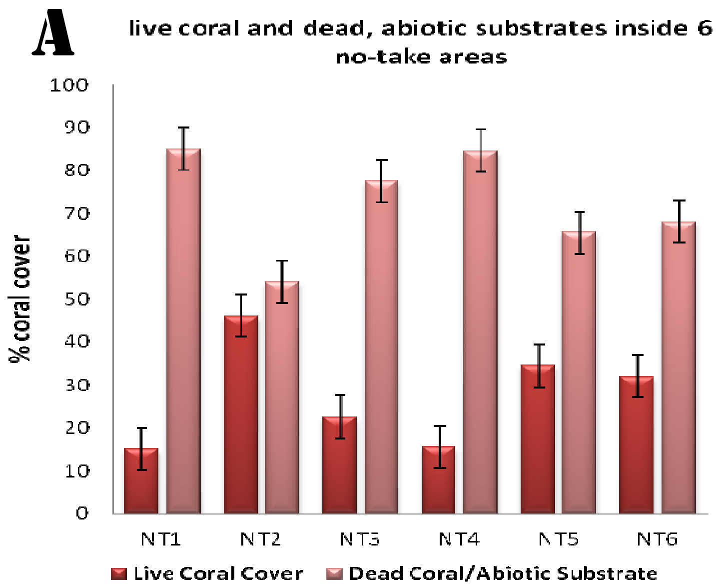
Collection of field data in this monitoring is very much the same as those done in March and June monitoring.

2.2. Data analysis

All data collected were analyzed using the same methods used in the previous reports (see previous reports for analysis methods)

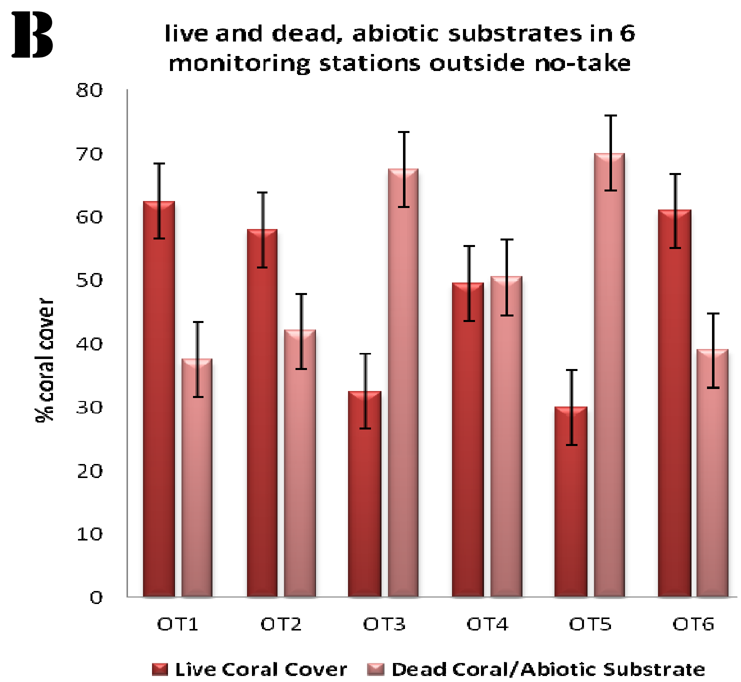
3. RESULTS

3.1.1 Benthic substrate for reefs inside no-take



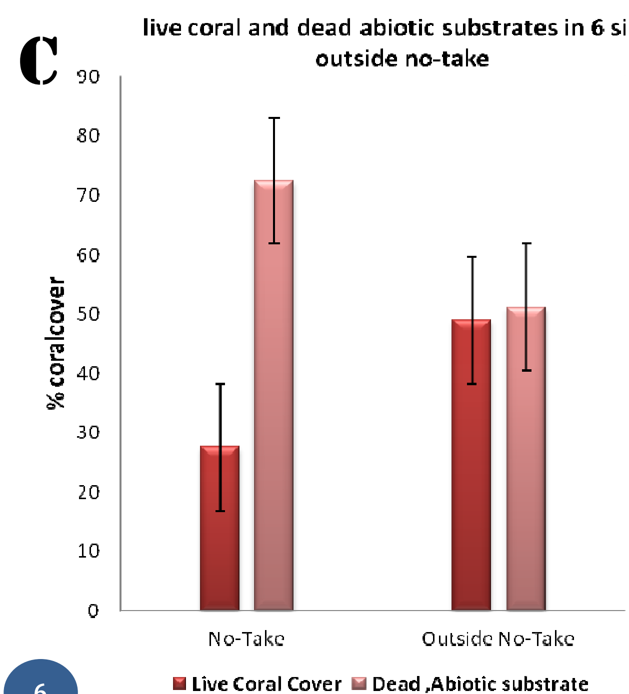
Benthic substrate for 6 monitoring stations inside no-take showed low live coral cover (27.6%) in comparision to dead abiotic substrate (72.4%). Tawali Namonamo (NT.1), Siasialina (NT.4) and Dana Gedu (NT.3) all recorded high abiotic substrates than live corals. Transact area at Tawali Namonamo recorded 85% where 38.5% of these abiotic substrate was dead coral rubble. At Siasialina, 84.5% was also dead, abiotic substrate whereby 47% of the abiotic substrate was dead coral rubble and at Dana Gedu, 77.5% was abiotic materials where 53% of the substrate was calcareous bedrock substratum. Thus, other minor constituents of abiotic substrate include attached dead corals and scattered sand patches.

3.1.2. Benthic substrates for reefs outside no-take areas



Benthic substrate for stations outside no-take zone varied across all 6 sites .Sites with live coral cover include Iabam NW (OT.1) with 62.5%, Kiwakiwalina (OT.6) with 61%; Iabam SE (OT.2) with 58% and Tawali Balabala (OT.4) recording 49.5%. Other 2 stations (OT.3 and OT.5 showed percentage cover much lower than (50%). The benthic substrate for Manikutu (OT.5) and SE Pahilele (OT.3) had 67.5% abiotic substrate which was made up of 97% hard bedrock substratum. Manikutu (OT.5) had (70%) which was made of exclusively of dead coral rubble (DCR) (43%) and Pahilele SE (OT.3) having (67.5%) dead abiotic materials which exclusively comprised 97% hard bed rock substratum

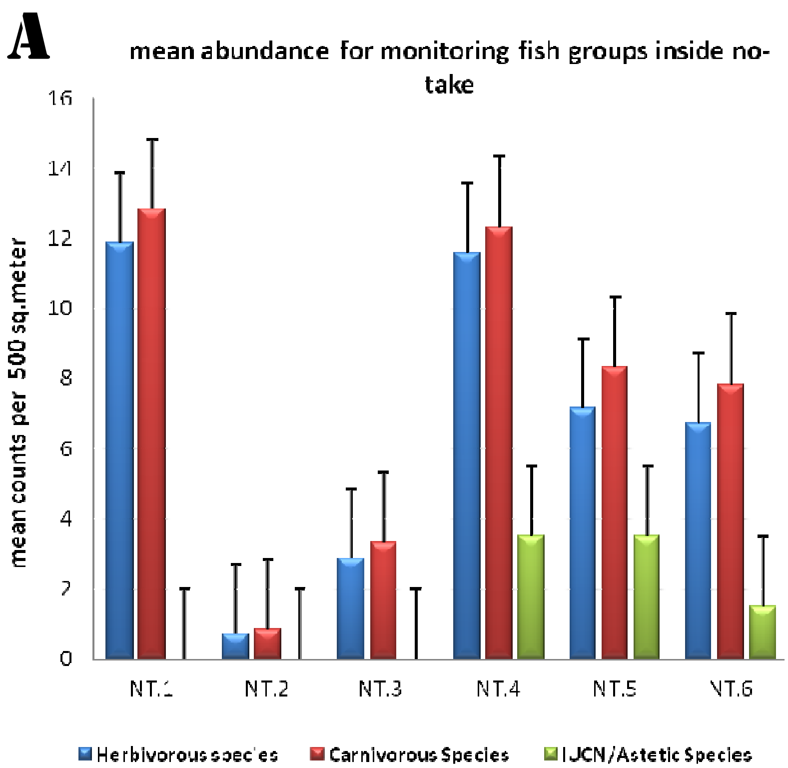
3.1.3. Benthic substrates for monitoring stations inside and outside no-take combined



Live coral cover for reefs inside no-take were lower than those found outside of the no-take (27.6% live coral cover inside no-take). Substrate composition for sites outside no-take showed little variation between live coral cover and dead, abiotic substrate.

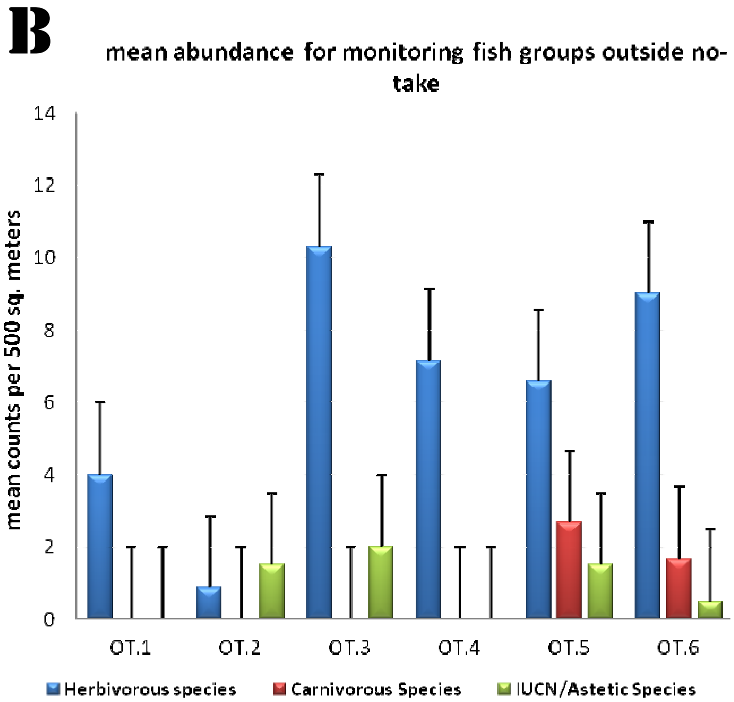
3.2 REEF FISH INDICATORS INSIDE & OUTSIDE NO-TAKE AREAS

3.2.1. Target Reef Fish indicators inside no-take



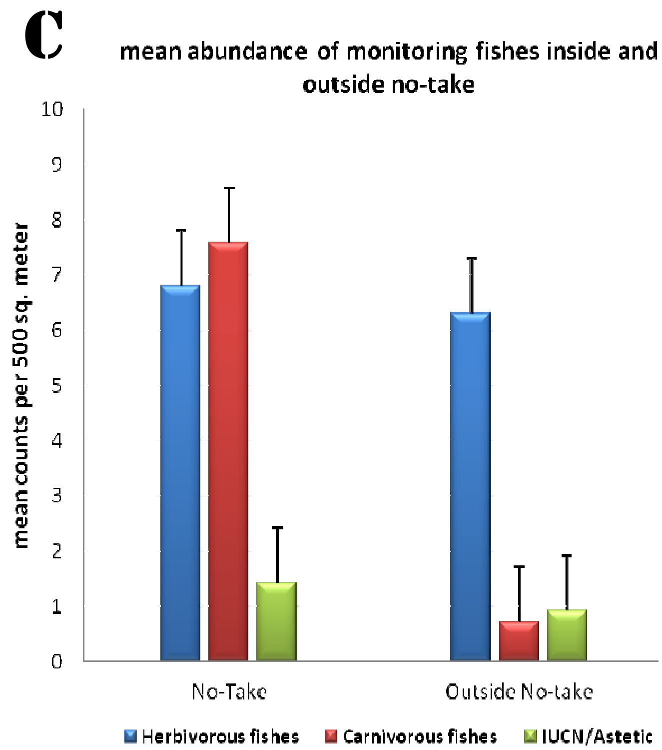
Average distribution patterns for herbivore and carnivore fishes per 500 m^2 transact are similar for all 6 NT sites. Average for herbivore fishes was 6.8 per 500m^2 and 7.6 per 500 m^2 for carnivorous fishes in all 6 sampling sites .The calculated average for each fish groups showed that Tawali Namonamo (NT.1) had the highest counts for two monitoring species respectevily (11.83 herbivore and 12.83 carnivore per 500 m^2). In this monitoring period we observed that Tawali Namonamo (NT.1) and Siasialina (NT.4) were the two sites having high abundance for both herbivores and carnivore fishes. Records for IUCN/aesthatic fishes were equally high for NT.4 and NT.5 , both recording 4 and 3 hump head Maori wrasse per 500 m^2 transact respectively.

3.2.2 target Reef Fish indicators outside no-take



Distribution and abundance for our target monitoring fishes in sites outside of no-take showed high distribution and abundance of herbivore fishes. 5 of the 6 monitoring stations had significant mean abundnces where the reef off SE Pahilele Island (OT.3) recorded the highest average with 10.29 fishes per 500 m^2. Second to this was Kiwakiwalina (OT.6) with mean abundance of 9 herbivore per 500 m^2. Population and distribution of carnivorous fishes inside 6 monitoring stations was very low. The mean abundance for this group in all 6 stations was 0.722 fishes per 500m^2 and the highest record wat at Manikutu reef (OT.5). Population distribution for the IUCN species was sparse and was only recorded at 4 out of 6 site, with the highest record from SE Pahilele reef only recorded for 4 out of 6 sites with the highest record from SE Pahilele reef (OT.3) and Manikutu (OT.5) with an average of 1.5 per 500 m^2.

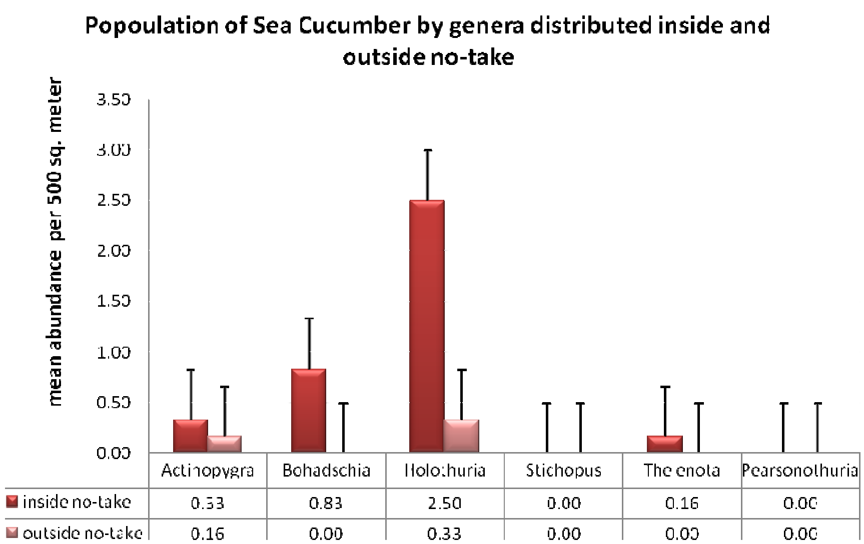
3.2.3. Mean abundances for target monitoring fishes inside and outside no-take areas combined



General overview of no-take and outside no-take fish distribution and abundance clearly illustrate that there is significant difference in the distribution of carnivorous fishes. No-take areas recorded a high average of 7.58 individuals per 500 m^2 than the outside no-take areas with mean occurance of 0.72 fishes per 500 m^2 . Population for herbivore fishes in both no-take tend to be evenly distributed, with mean abundance of 6.08 for no-take and 6 for sites outside no-take. IUCN and aesthatic fishes had low representation in both study areas.

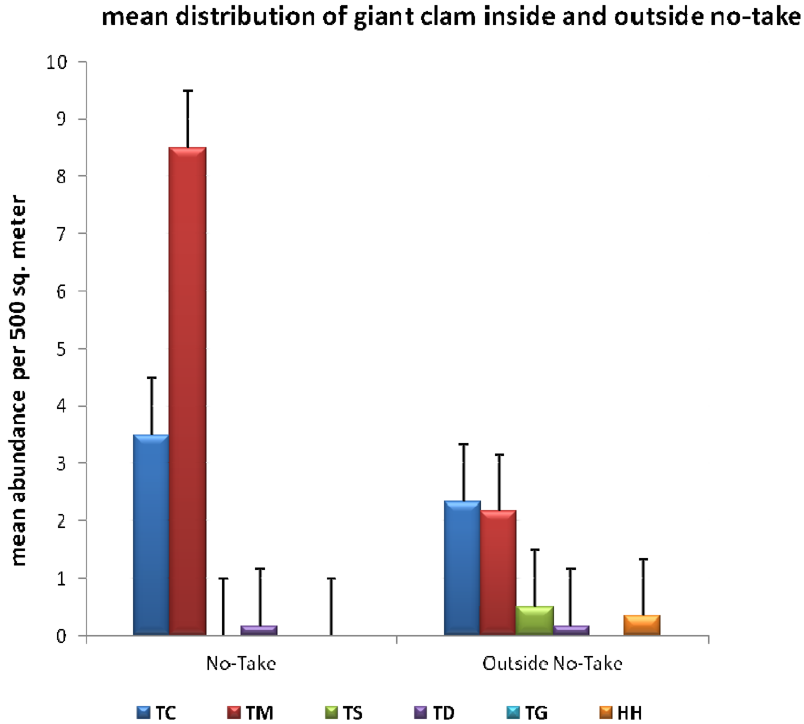
3.3 MARINE INVERTEBRATE

3.3.1 Sea cucumber population in no-take sites and in sites outside No-Take



Survey results for sea cucumber shows that genus holothuria had the highest distribution and abundance with average of 2.50 sea cucumber per 500 m^2 inside no-take areas. Monitoring stations outside no-take showed high abundance of genus Bohadschia. Other sea cucumber genera had very low presence inside each 500 m^2 areas for all sites inside and outside no-take.

3.3.2. Distribution of giant clam inside no-take and in areas outside no-take

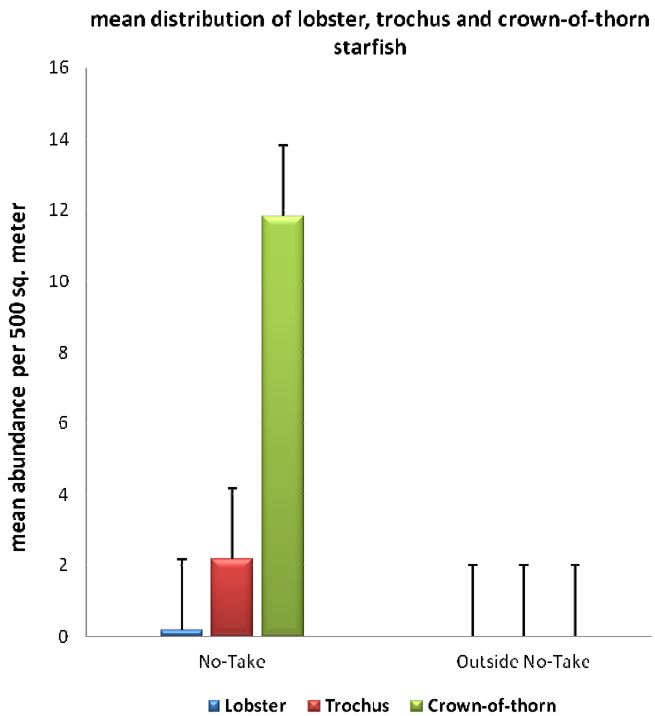


Information on giant clam clearly illustrates that no-take sites recorded the highest mean counts for Maxima clam (TM) inside the 6 monitoring transacts. Boring clam also recorded an average of 3.5 clams per 500 m^2 for 6 monitoring stations while other clam species had low presence.

Sites outside no-take were well represented by 5 of 6 clam species. Highest average for these monitoring stations was 2.41 and was from boring clam (TC). Maxima clam (TM) also had an almost similar abundance with 2.2 clams per 500 m^2 for 6 monitoring sites.

Fig. 1. Pictures of 4 out of 6 giant clam shells distributed around NIPCMMA

3.3.3. Other marine invertebrates (lobster, sea starfish, trochus, crown-of-thorns)



On average, stations inside no-take were the only areas to have recorded evidence of lobster, trochus and crown-of-thorn starfish inside their 500 m^2 transact. Data for lobster was low with mean of <1 individual while trochus had a mean of 2 individual per 500 m^2 and crown-of-thorn continue to have averages of 11.83 individuals per 500 m^2 samapling area for all 6 monitoring stations. Data for the same species were lower for individual sites outside no-take that their averages are much lower to be calculated.

4. DISCUSSION

4.1. Benthic substrate

There are many explanations to the uneven distributions of benthic substrate seen at different monitoring stations both inside and outside the management area of Iabam and Pahilele. Biophysical and geological characteristics of the different reefs coupled with exposure to tidal currents, storm surges and their location in relation to island runoffs and discharges are some of the many fundamental factors influencing what we have seen. The basis for coral reef growth is highly influenced by the benthic floor. For instance, benthic substrates with calcareous bedrock and/or solid material often accommodate coral larvae settlement and development into coral colony. Areas whereby benthic substrate is made up entirely of sand, mud, silt and other areas of algal growth are often not suitable for coral growth hence often result in less coral diversity.

Influence by tide cycle and seasonal variation (i.e. SE Tradewinds & NW Monsoon) often bring about favorable conditions or repercussion that are dire to a healthy reef system. Our monitoring data clearly shows this many reefs that were located on the peripheral areas showed very low coral cover. Others are located on very shallow reefs which are often exposed to wave breaks, swells and strong tidal currents that coral growth in those areas cannot sustain continuous wave's actions. Furthermore, corals often show preference, based on their tolerance level and natural resilience. As such, Tawali Namonamo (NT.1), Dana Gedu (NT.2) and Siasialina (NT.3) recorded very low live corals thus, highly distributed substrate at Dana Gedu (NT.3) and Siasialina (NT.4) were unconsolidated coral rubble which are end results of surge currents induced SE Tradewinds. Although there were corals distributed on the very shallow reef flat areas where monitoring stations are located, these corals were of morphologies that are of high wave tolerance, and can withstand any prevalent conditions. Live corals with morphologies such as boulder, brain, encrusting and digitate were common than branch and table corals.

On the other hand, the shallow reef flat areas on the island's fringing reefs had remarkable live coral cover. Iabam NW (OT.1) and Iabam SE (OT.2) are among the 3 sites having live coral cover that was over 60%. Both hard corals of form branching, table, encrusting digitate, massive and submassive were represented the two sites mentioned. Furthermore, there were also a lot more soft corals, foliose corals and massive, boulder corals along the permanent monitoring station. These diverse morphological representations of different coral types indicates very low levels of current driven waves and swells like those described for the outer barrier reefs. The leeward side of Kiwakiwalina (OT.6) and Tawali Balabala (OT.4) also recorded live coral cover percentage of over 50%.

Level of anthropogenic impacts was not significant in many sites except Dana Gedu which received a lot of silt and fine sediments discharged from mainland between July – September from torrential rainfall experienced in the province. Other likely source of anthropogenic wastes would be from large container and bulk carrier vessels that frequent Alotau using the route that runs parallel to Dana Gedu reef.

Fig 2. Typical reef systems surrounding Iabam-Pahilele CMMA. (Left) outer barrier reef slope (middle) shallow outer barrier reef flat with low complexity (Right) is a typical fringing reef around main islands of Iabam and Pahilele.

Distribution and abundance of reef fish and pelagic species around Iabam and Pahilele could generally be described adequate food security for the people of Iabam and Pahilele Islands. Observations made by this study or by this continuous monitoring program have specific objectives however in general, observations made through fisher interview and from fishermen's catches combined with information from other study such as the Deepwater SCUBA monitoring of reef fish justifies the significance of areas inside and outside no-take that is within the Iabam-Pahilele CMMA jurisdiction. Species ranging from large pelagic such as Spanish Mackerel, Dogtooth Tuna, Skipjack Tuna, Bigeye and Oxeye Scad, Rainbow runner and other benthic dwelling fishes such as coral trout, Rock Cod, Humphead Maori Wrasse, Snappers, Rabbitfishes and Surgeonfish all substantiate high food security sources at this present time.

Data collected for target monitoring fish species inside community designated no-take areas illustrate a high averages for both herbivore and carnivore fishes at Tawali Namonamo (NT.1) and Siasialina (NT.4). Respective averages recorded per 500 m^2 study area were 11.83 herbivore and

12.83 carnivores for site NT.1 and 11.57 herbivore and 12.33 carnivores for NT.4. Other sites inside no-take had low species abundance.

Data for fishes outside monitoring stations showed high abundance and distribution of herbivore fishes than any other monitoring fishes. Highest record was observed at SE Pahilele (OT.3) with average of 10.28 herbivore per study area. In general, there were good populations of Humphead Maori Wrasse (*Cheilinus undulatus*) found on many reef peripheries despite a low mean count observed in the 500 m^2 sampling areas for protected and open access areas.

4.2.1. Distributions of herbivore fishes

Distribution and abundance of reef fishes are determined by certain environmental factors. Most often, factors that is favorable to the organisms feeding, shelter and ecological needs. The distribution pattern displayed by herbivorous fishes is a good example to further deliberate on. The pattern of occurrence and distribution we saw at NIPCMMA is of no difference to what was documented by Russ (1984) in Great Barrier Reef. Russ (1984) documented local abundance of herbivore fishes were often abundant on reefs where there was high abundance of epilithic algae and that grazing intensity was significantly higher in shallow (1-10m) reef slopes than on deep (30-40 m) reef slopes or on shallow reef flats. The distribution of herbivore fishes particularly Acanthurids (surgeonfish) and Scarids (Parrotfish) were more dominant at the barrier reef than at the shallow fringing reefs. Population of Siganids (Rabbitfishes) particularly forktail rabbitfish (*Siganus argenteus*) or locally know as "Debi" were found to be more dominant on the shallow reef flat habitats. Their abundance was recorded at Manikutu (OT.5) where there were seen in small schools.
Another potential explanation to the low density on shallow Islands fringing reefs could be attributed to overfishing through the use of gillnets and night spearfishing that was once a common practice before the island communities accepted conservation and management. Sightings of smaller size cohorts on the fringing reefs as opposed by those seen at the outer barrier reefs further justify their exploitations over the past 2 decades.

4.2.2. Distributions of carnivorous fishes

Data from this monitoring indicate that there was high abundance of carnivore fishes inside the protected zone than the open fishing areas. Many explanations could be used to for this however, key attribute to this lies with exposure to food. Being located in areas where currents are consistent, there were a lot of food sources for this fish group. Fishing pressure on the outer barrier reefs would be another attribute. As these areas are furthest from Iabam and Pahilele islands, accessibility to these areas is often on a weekly or monthly basis. In addition, during the months of SE Trade Winds these areas are not accessed at all. The immediate fringing reefs surrounding the two islands (Iabam and Pahilele) are the key food security areas therefore; distribution of this fish group is low.

Fish size is still of a concern at this stage for both carnivore and herbivore fishes. There were a lot smaller fish than large size in the areas we monitor. Data and information on sizes for the lower reef slopes and deep water areas cannot be made here nevertheless; this information will be made available in the deepwater monitoring report.

Fig 3. Some of the key fishes identified on the shallow monitoring transacts of Iabam-Pahilele CMMA. (Left) Mix aggregation of surgeonfish and Debi (Forktail rabbitfish) (Middle). Slender grouper (*Anyperodon leucogrammicus*) (Right) A monitoring species locally known as Lusaido or in English it is called Blue spotted hind (*Cephalopholis cyanostigma*)

4.3. Sea Cucumber

Sea cucumber populations for waters surrounding Iabam and Pahilele CMMA generally show low species diversity and low population counts. The only genus with high counts was *Holothuria*. Distribution of this genus was observed to be more on the outer barrier reefs as data from shallow monitoring indicates. Samples obtained from 8 no-take areas indicate a mean abundance of 2.50 individuals per $500m^2$ while areas outside no-take had an average of 0.33 individuals per 500 m^2. Sea cucumber with second high distribution and abundance was *Bohadschia* which averages of 0.83 per 500 m^2 for no-take and no record for sites outside no-take. Presence of other sea cucumber genera was low and their abundances recorded in the following descending order: Bohadschia, *Actinopygra*, *Thelonata* and *Pearsonothuriadae*. Those sea cucumber recorded were of medium to large sizes with regard to their respective cohorts. There was little evidence of new recruitment observed in this monitoring period which explanation to this cannot be established at present.

4.4. Clam Shell

As described by Wamula (2011) in his June monitoring report, distribution pattern of giant clams are determined by substrate type and environment conditions surrounding each reef systems. Data from this monitoring period is again very similar to that seen in the June monitoring period.

4.5. Other invertebrates *(Lobster, trochus, crown-of-thorn starfish)*

Population counts for lobster inside each monitoring transact and inside 12 monitoring stations show low abundance. As shown by the graph in section 3.2.3, population counts for lobster was lower than expected. Although some monitoring stations had fair habitat coverage for lobster, their presences were not there. It would be interesting to observe the deepwater monitoring data and results to see if many of the lobster species are located on reef crevices on the lower part of the reefs inside some of our monitoring stations.

Population counts for trochus shells were again low for many reefs inside and outside no-take areas. Thus, the no-take area recorded an average of 13 individuals in the entire 6 monitoring stations while there was no record for any trochus in sites outside no-take (see graph in section 3.3.3). Many reefs had the necessary requirements for trochus however; their population failed to be there in those habitats. The only potential explanation for this low population would be overharvesting by Iabam and Pahilele communities over years. Stock recovery is still possible as there may have been many species in the areas that have not been surveys however; these remnant population need significant protection in order to seed new larvae for future stocks.

Crown-of-thorn starfish population was a little lower for many individual sites outside the no-take areas while there were more crown-of-thorn recorded for sites inside no-take than the 2 previous studies. Increase in this number of crown of thorn population inside no-take cannot be provided here as it will require a separate study on its own to quantify this. Having said this, we can only tell you that the increase in population numbers is a direct cause of increase sediment and land base nutrient supply as a result of the continuous rainy season Milne Bay province faced over the last months. A scientific study by Pratchett (2005) on Lizard Island, Great Barrier Reef further demonstrate that increase terrestrial runoffs and increase sea temperatures are remedy for reproduction as the condition is essential for the survival of larvae and enhance growth in many small-medium individuals. Pratchett (2005) further explained that there are two key elements of growth and increase through increased survival of post-settlement individuals caused by reduction in predation pressure (Edean 1969; Pratchett 2005) or increased availability of coral prey. Moreover, two important hypothesis for increase population numbers lies with 1). A single mass recruitment event or from 2). Progressive accumulation of starfish from multiple cohorts (Johnson 1992; Pratchett 2005).

The process of controlling these populations will require significant amount of study into behavioral and reproductive biology so that appropriate management measures can be applied accordingly. At this stage our community is not technically prepared to undertake any eradication program.

5.0 Conclusion

Findings from the September monitoring were important as it provided the opportunity to assess our marine resources immediately after two major events in the province.

1. Impacts associate with the SE Trade Winds that concluded in August and
2. The impact of torrential rain over the months of July to August. A potential cause of large terrestrial runoffs that affected Dana Gedu (NT.3) through increase of freshwater discharge and reduced sea salinity as well as increase sediment and silt discharge which could have direct explanation to Dana Gedu and Kiwakiwalina reefs recording high numbers of crown-of-thorn starfish (i.e. 12 at Dana Gedu and 43 at Kiwakiwalina per $500m^2$ study areas).

It will become interesting for analysis of the coming December monitoring data as population trend for key indicator species will be provided to see the changes happening over the 1 year period of resource management and from monitoring.

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